EVALUATION REPORT FOR LNG FACILITY CONSTRUCTION

A completed **Standard Inspection Report** is to be submitted to the Director within 60 days from completion of the inspection. A **Post Inspection Memorandum (PIM)** is to be completed and submitted to the Director within 30 days from the completion of the inspection, or series of inspections, and is to be filed as part of the **Standard Inspection Report.** Refer to the last page of this form for **PIM** example entries.

Inspection Report	Post Inspection Memorandum
Inspector/Submit Date: _____	**Inspector/Submit Date:** _____ **Peer Review/Date:** _____ **Director Approval/Date:** _____

POST INSPECTION MEMORANDUM (PIM)		
Name of Operator:		**OPID #:**
Name of Unit(s):		**Unit # (s):**
Records Location:		
Unit Type & Commodity:		
Inspection Type:	**Inspection Date(s):**	
OPS Representative(s):		**AFO Days:**
Summary:		
Findings:		

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Name of Operator:	
H.Q. Address:	**System/Unit Name and Address:**
Co. Official: **Phone No.:** **Fax No.:** **Emergency Phone No.:**	**Activity Record ID#:** **Phone No.:** **Fax No.:** **Emergency Phone No.:**

Persons Interviewed	Titles	Phone No.

OPS Representative(s):	**Date(s):**
Company System Maps (copies for Region Files):	

Type of facility: **Base Load** _____ **Satellite** _____ **Peak Shaving** _____ **Mobile/Temporary** _____

Note: Some mobile and temporary LNG facilities must meet the requirements of Section 2.3.4 of NFPA 59A (2001 edition) in lieu of the requirements of Part 193 per 193.2019.

Replaced, Relocated, or significantly Altered existing LNG facility		**New LNG facility**	
Year Facility Was Placed In Operation: **Increase in Liquefaction Rate, MMCFD:** **Change to Liquefaction Cycle:** **Change to Vaporizers & Capacities:** **New Storage Tank Statistics:** **- (Fabricator, Volumes, Materials, etc).:**		**Construction Start Date:** **Liquefaction Rate, MMCFD:** **Type Of Liquefaction Cycle:** **Number of Vaporizers & Capacities:** **Storage Tank Statistics:** **- (Fabricator, Volumes, Materials, etc).:**	
Comments:			

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SITING						
		§193.2057 THERMAL RADIATION PROTECTION	**S**	**U**	**N/A**	**N/C**
.2057		Each LNG container and LNG transfer system must have a thermal exclusion zone in accordance with section 2.2.3.2 of NFPA 59A with the following exception (to NFPA-59A 2.2.3.2): (a) The thermal radiation distances shall be calculated using Gas Research Institute's (GRI) report GRI-89/0176, (available as the ``LNGFIRE III'' computer model produced by GRI), **or other alternate models which take into account the same physical factors and have been validated by experimental test data shall be permitted subject to the Administrator's approval**. (b) In calculating exclusion distances, the wind speed producing the maximum exclusion distances shall be used except for **wind speeds that occur less than 5 percent of the time** based on recorded data for the area. (c) In calculating exclusion distances, the **ambient temperature** and **relative humidity** that produce the maximum exclusion distances shall be used except for values that **occur less than five percent of the time** based on recorded data for the area.				
.2057	NFPA 59A 2.2.3.2	Provisions shall be made to prevent thermal radiation flux from a fire from exceeding the following limits and damaging effects of fire reaching beyond a property line that can be built upon: *(Note:* Volume of LNG determined in accordance with 2.2.2.1)				
		(1) 1600 Btu/hr/ft2 (5000 W/m2) at a property line that can be built upon forignition of a design spill (as specified in2.2.3.5),				
		(2) 1600 Btu/hr/ft2 (5000 W/m2) at the nearest point located outside the owner's property line that, **at the time of plant siting**, is used for outdoor assembly by groups of 50 or more persons for a fire over an impounding area containing a volume, *V*,				
		(3) 3000 Btu/hr/ft2 (9000 W/m2) at the nearest point of the building or structure outside the owner's property line **that is in existence at the time of plant siting** and used for occupancies classified by NFPA *101*®, *Life Safety Code*®, as assembly, educational, health care, detention and correction or residential for a fire over an impounding area containing a volume, *V*, and				
		(4) 10,000 Btu/hr/ft2 (30,000 W/m2) at a property line that can be built upon for a fire over an impounding area containing a volume, *V*.				
Comments: *(If any of the above is marked U, N/A, or N/C, please indicate why, either in this box or in a referenced note):*						

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		§193.2059 FLAMMABLE VAPOR-GAS DISPERSION PROTECTION				
.2059		Each LNG container and LNG transfer system must have a dispersion exclusion zone in accordance with sections 2.2.3.3 and 2.2.3.4 of NFPA 59A with the following exception (to NFPA-59A 2.2.3.3 and 2.2.3.4): (a) Flammable vapor-gas dispersion distances must be determined in accordance with the model described in the Gas Research Institute report GRI-89/0242 and Gas Research Institute report GRI-96/0396.5, **or other alternate models which take into account the same physical factors and have been validated by experimental test data shall be permitted, subject to the Administrator's approval** (b) The following dispersion parameters must be used in computing dispersion distances: (1) Average gas concentration in air = 2.5 percent. (2) Dispersion conditions are a combination of those which result in longer predicted downwind dispersion distances than other weather **conditions at the site at least 90 percent of the time**, based on figures maintained by National Weather Service of the U.S. Department of Commerce, or as an **alternative where the model used gives longer distances at lower wind speeds**, percent, and atmospheric temperature = average in the region. (3) The elevation for contour (receptor) output H = 0.5 meters. (4) A surface roughness factor of 0.03 meters shall be used. **Higher values for the roughness factor may be used if it can be shown that the terrain both upwind and downwind of the vapor cloud has dense vegetation and that the vapor cloud height is more than ten times the height of the obstacles encountered by the vapor cloud.** (c) The design spill shall be determined in accordance with section 2.2.3.5.				
.2059	NFPA 59A 2.2.3.3	The spacing of an LNG tank impoundment to the property line that can be built upon shall be such that, in the event of an LNG spill specified in 2.2.3.5, an average concentration of methane in air of 50 percent of the lower flammability limit (LFL) does not extend beyond the property line that can be built upon, using calculations in 2.2.3.3.				
	NFPA 59A 2.2.3.4	Make provisions to minimize the possibility of a flammable mixture of vapors from a design spill specified in 2.2.3.5, as appropriate, reaching a property line that can be built upon and that would result in a distinct hazard. Flammable mixture dispersion distances shall be determined in accordance 2.2.3.4 (a-b).				
Comments: *(If any of the above is marked U, N/A, or N/C, please indicate why, either in this box or in a referenced note):*						

		§193.2067 WIND FORCES	S	U	N/A	N/C
.2067	.2067(a)	LNG facilities must be designed to withstand without loss of structural or functional integrity: (1) The direct effect of wind forces; (2) The pressure differential between the interior and exterior of a confining, or partially confining, structure; and (3) In the case of impounding systems for LNG storage tanks, impact forces and potential penetrations by wind borne missiles.				

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		§193.2067 WIND FORCES (con't.)	S	U	N/A	N/C
.2067	.2067(b)	The wind forces at the location of the specific facility must be based on one of the following: (1) For shop fabricated containers of LNG or other hazardous fluids with a capacity of not more than 70,000 gallons, use applicable wind load data in ASCE 7. (2) For all other LNG facilities: (i) An assumed sustained wind velocity of not less than 150 miles per hour, unless the Administrator finds a lower velocity is justified by adequate supportive data; or (ii) The most critical combination of wind velocity and duration, with respect to the effect on the structure.				
.2051	NFPA-59A 2.1.4	The wind and snow loads for LNG storage containers design shall be determined using ASCE 7.				
Comments: *(If any of the above is marked U, N/A, or N/C, please indicate why, either in this box or in a referenced note):*						

		NFPA-59A SUBPARTS	S	U	N/A	N/C
§ 193.2051		Each LNG facility designed, constructed, replaced, relocated or significantly altered after March 31, 2000 must be provided with siting requirements in accordance with the requirements of this part and of NFPA 59A.				
.2051	NFPA-59A 2.1.4	Soil and general investigations of the site shall be made to determine the design basis for the facility.				
Comments: *(If any of the above is marked U, N/A, or N/C, please indicate why, either in this box or in a referenced note):*						

DESIGN					
	§193.2119 RECORDS	S	U	N/A	N/C
.2119	Each operator shall keep a record of all materials for components, buildings, foundations, and support systems, as necessary to verify that material properties meet the requirements of this part. These records must be maintained for the life of the item concerned.				
Comments: *(If any of the above is marked U, N/A, or N/C, please indicate why, either in this box or in a referenced note):*					

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		§193.2155 STRUCTURAL REQUIREMENTS	S	U	N/A	N/C
.2155	.2155(a)	(a) The structural members of an impoundment system must be designed and constructed to prevent impairment of the system's performance reliability and structural integrity as a result of the following:				
		(1) Imposed loading from— (i) Full hydrostatic head of impounded LNG; (ii) Hydrodynamic action from injected material; (iii) Impingement of LNG jet trajectory discharged at any predictable angle; (iv) Anticipated hydraulic forces from a credible opening in the component or item served, assuming the discharge pressure equals design pressure.				
		(2) Erosive action from a spill, including jetting of spilling LNG, and any other anticipated erosive action including surface water runoff, ice formation, dislodgement of ice formation, and snow removal.				
		(3) Effect of the temperature, any thermal gradient, and any other anticipated degradation resulting from sudden or localized contact with LNG.				
		(4) Fire exposure from impounded LNG or LNG from other sources.				
		(5) If applicable, the potential impact and loading on the dike due to – (i) Collapse of the component or item served or adjacent components; (ii) If the LNG facility adjoins the right-of-way of any highway or railroad, collision by or explosion of a train, tank car, or tank truck that could reasonably be expected to cause the most severe loading.				
.2155	.2155(b)	(b) An LNG storage tank must not be located within a horizontal distance of one mile (1.6 km) from the ends, or ¼ mile (0.4 km) from the nearest point of a runway, whichever is longer. The height of LNG structures in the vicinity of an airport must comply with FAA, 14 CFR Section 1.1.				
Comments: *(If any of the above is marked U, N/A, or N/C, please indicate why, either in this box or in a referenced note):*						

	§193.2161 DIKES	S	U	N/A	N/C
.2161	An outer wall of a component served by an impounding system may not be used as a dike unless the outer wall is constructed of concrete.				
Comments: *(If any of the above is marked U, N/A, or N/C, please indicate why, either in this box or in a referenced note):*					

	§193.2167 COVERED SYSTEMS	S	U	N/A	N/C
.2167	Except for a concrete wall designed tank, a covered impounding system is prohibited where the concrete wall is an outer wall serving as a dike.				
Comments: *(If any of the above is marked U, N/A, or N/C, please indicate why, either in this box or in a referenced note):*					

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		§193.2173 WATER REMOVAL	S	U	N/A	N/C
.2173	.2173(a)	(a) Impoundment areas must be designed so all areas drain completely, to prevent water collection. Drainage pumps and piping must be provided to remove water from collecting in the impoundment area. Alternative means of draining approved by the Administrator's may be acceptable.				
	.2173(b)	(b) The water removal system must have adequate capacity to remove water at a rate equal to 25% of the maximum predictable collection rate from a storm of 10-year frequency and 1-hour duration, and other natural causes.				
	.2173(c)	(c) Sump pumps for water removal must— (1) Be operated as necessary to keep the impounding space as dry as practical; and (2) If designed for automatic operation, must have redundant automatic shutdown controls to prevent operation when LNG is present.				

Comments: *(If any of the above is marked U, N/A, or N/C, please indicate why, either in this box or in a referenced note):*

		NFPA-59A SUBPARTS	S	U	N/A	N/C
§193.2173		Each LNG facility designed after March 31, 2000 must comply with requirements of this part and of NFPA 59A.				
.2173	NFPA-59A 2.1.2	Site preparation included for retention of spilled LNG, flammable refrigerants, liquids, and surface water drainage within limits of the plant.				
	NFPA-59A 2.1.3	The maximum allowable working pressure shall be specified for all components.				
	NFPA-59A 2.1.4	Soil and general investigations of the site shall be made to determine the design basis for the facility.				
	NFPA-59A 2.2.1.1	Provisions made to minimize the possibility of the accidental discharge of LNG at containers from endangering adjoining property or important process equipment and structures or from reaching waterways in accordance with one of three stated methods.				
	NFPA-59A 2.2.1.2(4)	Areas immediately surrounding flammable refrigerant and flammable liquid storage tanks shall be graded, drained, or provided with impoundment in a manner that minimizes the possibility of accidental spills and leaks important structures, equipment, or adjoining property or that could reach waterway.				
	NFPA-59A 2.2.1.4	Flammable liquid and flammable refrigerant storage tanks shall not be located within an LNG container impounding area.				
	NFPA-59A 2.2.3.6	LNG container impounding areas located so that the heat flux from a fire over the impounding area shall not cause major structural damage to any LNG marine carrier that could prevent its movement.				
	NFPA-59A 2.2.3.7	Containers with an aggregate storage of 70,000 gal (265 m3) or less on one site shall be permitted to be installed in accordance with Table 2.2.4.1 And be equipped with failsafe equipment and appurtenances.				
	NFPA-59A 2.2.4.1	The minimum distance between LNG containers or flammable refrigerants tanks and exposures shall be in accordance with Table 2.2.4.1.				
	NFPA-59A 2.2.4.2	A clear space of at least 3 ft (0.9 m) shall be provided for access to all isolation valves serving multiple containers.				
	NFPA-59A 2.2.4.3	LNG containers of greater than 125-gal (0.5-m3) capacity shall not be located in buildings.				

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		NFPA-59A SUBPARTS (con't)	S	U	N/A	N/C
.2173	NFPA-59A 2.5	LNG containers, cold boxes, piping and pipe supports, and other cryogenic apparatus shall be designed and constructed properly to prevent damage to these structures and equipment due to freezing or frost heaving in the soil.				
	NFPA-59A 4.1.2.1	The operator shall specify (1) the maximum allowable working pressure, which includes a margin above the normal operating pressure, and (2) the maximum allowable vacuum.				
	NFPA-59A 4.1.2.2	Those parts of LNG containers that normally are in contact with LNG and all materials used in contact with LNG or cold LNG vapor [vapor at a temperature below -20^{o}F shall be physically and chemically compatible with LNG and intended for service at -270^{o}F.				
	NFPA-59A 4.1.2.3	All piping that is a part of an LNG container, including all piping internal to the container, within insulation spaces, within void spaces, and external piping attached or connected to the container up to the first circumferential external joint of the piping shall be in accordance with NFPA-59A Chapter 6 "Piping Systems and Components". Inert gas purge systems wholly within the insulation spaces are exempt from this provision. For ASME containers, all piping that is a part of an LNG container, including piping between the inner and outer containers, shall be in accordance with either the ASME Boiler and Pressure Vessel Code, Section VIII, or ASME B 31.3, Process Piping.				
	NFPA-59A 4.1.2.4	All LNG containers shall be designed to accommodate both top and bottom filling unless other positive means are provided to prevent stratification.				
	NFPA-59A 4.1.2.5	Any portion of the outer surface area of an LNG container that could accidentally be exposed to low temperatures resulting from the leakage of LNG or cold vapor from flanges, valves, seals, or other nonwelded connections shall be intended for such temperatures or protected from the effects of such exposure.				
	NFPA-59A 4.1.2.6	Where two or more containers are sited in a common dike, the container foundations shall be capable of withstanding contact with LNG or shall be protected against contact with an accumulation of LNG that might endanger structural integrity.				
	NFPA-59A 4.1.3.1	Seismic loads shall be considered in the design of the LNG container and its impoundment system.				
	NFPA-59A 4.1.3.2 & 4.1.3.3	The LNG container, its impounding system, LNG container isolation components, fire protection system, and structures or systems whose failure could affect the integrity of the LNG container and its isolation components shall be designed for two levels of seismic ground motion, the operating basis earthquake (OBE) and the safe shutdown earthquake(SSE).				
	NFPA-59A 4.1.3.4	The LNG container, its impounding system, LNG container isolation components, fire protection system, and structures or systems whose failure could affect the integrity of the LNG container and its isolation components shall be designed to remain operable during and after an OBE and to isolate and maintain the LNG container during and after the SSE.				
	NFPA-59A 4.1.3.6	The LNG container shall be designed for the OBE, and a stress-limit check shall be made for the SSE to ensure compliance with 4.1.3.4.				
	NFPA-59A 4.1.3.7	The design of the LNG container and associated structural components including pile caps shall incorporate a dynamic analysis that includes the effects of sloshing and restrained liquid.				
	NFPA-59A 4.1.3.9	The container and its supports shall be designed for the resultant seismic forces in combination with the operating loads.				

		NFPA-59A SUBPARTS (con't)	S	U	N/A	N/C
.2173	NFPA-59A 4.1.3.11	Instrumentation capable of measuring the ground motion to which containers are subjected shall be provided on the site.				
	NFPA-59A 4.1.5.1	Any exposed insulation shall be noncombustible, shall contain or inherently shall be a vapor barrier, shall be water free, and shall resist dislodgment by fire hose streams. Where an outer shell is used to retain loose insulation, the shell shall be constructed of steel or concrete. Exposed weatherproofing shall have a flame spread rating not greater than 25, as per 1.7.14.				
	NFPA-59A 4.1.5.2	The space between the inner tank and the outer tank shall contain insulation that is compatible with LNG and natural gas and that is noncombustible. See Exception in 4.1.5.2.				
	NFPA-59A 4.1.6	Containers designed to operate in excess of 15 psi shall have a device(s) that prevents the container from becoming liquid full or from covering the inlet of the relief device(s) with liquid when the pressure in the container reaches the set pressure of the relieving device(s).				
	NFPA-59A 4.1.7.1	LNG container foundations shall be designed by a qualified engineer and constructed in accordance with recognized structural engineering practices. Prior to the start of design and construction of the foundation, a subsurface investigation shall be conducted by a qualified soils engineer to determine the stratigraphy and physical properties of the soils underlying the site.				
	NFPA-59A 4.1.7.2	The bottom of the outer tank shall be above the groundwater table or otherwise protected from contact with groundwater at all times. The outer tank bottom material in contact with soil shall be one of the following: (1) Selected to minimize corrosion (2) Coated or otherwise protected to minimize corrosion (3) Protected by a cathodic protection system				
	NFPA-59A 4.1.7.3	Where an outer tank is in contact with the soil, a heating system shall be provided to prevent the 32°F isotherm from penetrating the soil and be designed IAW NFPA-59A, 4.1.7.3.				
	NFPA-59A 4.1.7.4	If the foundation is installed to provide air circulation in lieu of a heating system, the bottom of the outer tank shall be of a material compatible with the temperatures to which it can be exposed.				
	NFPA-59A 4.1.7.5	If a tank bottom temperature monitoring system is installed, it must be capable of measuring the temperature on a predetermined pattern over the entire surface area of the bottom insulation and any tank foundation heating system..				
	NFPA-59A 4.1.7.6	The LNG container foundation shall be monitored periodically for settlement during construction, hydrostatic testing, and commissioning. Any settlement in excess of that anticipated in the design shall be investigated and corrective action taken as required.				
	NFPA-59A 4.2.1	Welded containers designed to operate ≤ 15 psi shall comply with API 620, Design and Construction of Large, Welded, Low-Pressure Storage Tanks.				
	NFPA-59A 4.2.2.1	Containers shall be double-walled, with the inner tank holding the LNG surrounded by insulation contained within the outer tank. The insulation shall be evacuated or purged.				
	NFPA-59A 4.2.2.2	The inner tank shall be of welded construction and IAW Section VIII of the ASME Boiler and Pressure Vessel Code and shall be ASME-stamped and registered with the National Board of Boiler and Pressure Vessel Inspectors or other agencies that register pressure vessels.				

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		NFPA-59A SUBPARTS (con't)	S	U	N/A	N/C
.2173	NFPA-59A 4.2.2.3	The outer tank shall be of welded construction: (a) Appropriate carbon steel, IAW applicable stated standards, (b) If vacuum insulation is used, IAW applicable stated standards, (c) Maximum allowable working pressures shall be specified for all components, (d) Have a properly designed relief valve, (e) Thermal barriers shall be provided, (f) Saddles and legs designed IAW recognized structural practices, and (g) Foundations and supports be protected to have fire-resistance rating of not less than 2 hours..				
	NFPA-59A 4.2.2.4	Stress concentrations from the support system shall be minimized by the use of such items as pads and load rings.				
	NFPA-59A 4.2.2.5	Internal piping within the insulation space between the inner and outer tanks shall be designed for the maximum allowable working pressure of the inner tank, with allowance for thermal stresses. Bellows shall not be permitted within the insulation space.				
	NFPA-59A 4.2.2.6	The inner tank shall be supported concentrically within the outer tank by either a metallic or a nonmetallic system that is capable of sustaining the maximum loading.				
	NFPA-59A 4.3.2.1	The design of concrete containers shall be in accordance with 4.3.2.2 through 4.3.2.5 and shall comply with standards ACI 318, Building Code Requirements for Reinforced Concrete.				
	NFPA-59A 4.3.2.2	Allowable stresses for normal design considerations shall be based on room temperature specified minimum strength values.				
	NFPA-59A 4.3.2.3	Tensile stresses (exclusive of direct temperature and shrinkage effects) in carbon steel reinforcing bars when exposed to LNG temperatures under design conditions shall be limited to the allowable stresses listed in Table 4.3.2.3.				
	NFPA-59A 4.3.2.4	Steel wire or strands, as specified in 4.3.3.4 and used as unstressed reinforcement, shall be designed with a maximum allowable stress as follows: (1) Crack control applications — 30,000 psi (2) Other applications — 80,000 psi				
	NFPA-59A 4.3.2.5	External forces imposed on the container by backfill restraint during warm-up shall be considered.				
	NFPA-59A 4.3.3.1	Concrete shall be in accordance with the requirements of ACI 304R, Guide for Measuring, Mixing, Transportation and Placing of Concrete, and ACI 318, Building Code Requirements for Reinforced Concrete.				
	NFPA-59A 4.3.3.2	Aggregate shall be specified by ASTM C 33, Standard Specification for Concrete Aggregates .				
	NFPA-59A 4.3.3.3	Pneumatic mortar shall be in accordance with ACI Standard 506.2, Specification for Materials, Proportioning, and Application of Shotcrete.				
	NFPA-59A 4.3.3.4	High tensile strength elements for prestressed concrete shall meet the applicable stated standards.				
	NFPA-59A 4.3.3.5	Reinforcing steel for reinforced concrete shall be as specified by applicable stated standards.				
	NFPA-59A 4.3.3.6 & 4.3.3.7	Nonstructural metallic barriers incorporated in prestressed concrete shall be of a metal classified for either "primary components" or "secondary components".				

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		NFPA-59A SUBPARTS (con't)	S	U	N/A	N/C
.2173	NFPA-59A 4.7.1	All containers shall be equipped with pressure and vacuum relief devices in accordance with: (a) API 620, for containers designed to operate at ≤ 15 psi. (b) The ASME Boiler and Pressure Vessel Code, Section VIII, for containers designed to operate > 15 psig The relief devices shall be sized in accordance with Section 4.7.				
	NFPA-59A 4.7.2	Relief devices shall vent directly with the atmosphere. Vacuum relieving devices shall be installed if the container can be exposed to a vacuum condition in excess of that for which the container is designed.				
	NFPA-59A 4.7.2.1	Each pressure and vacuum safety relief valve for LNG containers shall be able to be isolated from the container for maintenance or other purposes by means of a manual full opening stop valve and sufficient pressure and vacuum relief valves shall be installed on the LNG container as described in this section.				
	NFPA-59A 4.7.2.3	Safety relief valve discharge stacks or vents shall be designed and installed to prevent an accumulation of water, ice, snow, or other foreign matter and shall discharge vertically upward.				
	NFPA-59A 4.7.3.1	The pressure relief devices shall be sized to relieve the flow capacity determined for the largest single contingency or any reasonable and probable combination of contingencies.				
	NFPA-59A 7.1.1.1	LNG containers shall be equipped with two independent liquid level gauging devices. The devices shall be designed and installed so they can be replaced without taking the tank out of operation.				
	NFPA-59A 7.1.1.2	The container shall be provided with two, independent high-liquid level alarms, which will be part of the liquid level gauging devices. The high-liquid-level flow cutoff device required in 7.1.1.3 shall not be considered as a substitute for the alarm.				
	NFPA-59A 7.1.1.3	The LNG container shall be equipped with a high-liquid-level flow cutoff device, which shall be separate from all gauges.				
	NFPA-59A 7.1.2.1	Each storage tank shall be equipped with a liquid level gauging device. If it is possible to overfill the tank, a high-liquid level alarm shall be provided in accordance with 7.1.1.2.				
	NFPA-59A 7.1.2.2	Flammable refrigerants containers shall be equipped with a high-iquid-level flow cutoff device, which shall be separate from all gauges.				
	NFPA-59A 7.2	Each container shall be equipped with a pressure gauge connected to the container at a point above the maximum intended liquid level.				
	NFPA-59A 7.4	Temperature-monitoring devices shall be provided in field-erected containers to assist in controlling temperatures when placing the container into service or as a method of checking and calibrating liquid level gauges.				
	NFPA-59A 7.4.2	Temperature-monitoring systems shall be provided where foundations supporting cryogenic containers and equipment could be affected adversely by freezing or frost heaving of the ground.				
	NFPA-59A 7.5	Instrumentation for liquefaction, storage, and vaporization facilities shall be designed so that, if a power or instrument air failure occurs, the system will proceed to a failsafe condition and maintain that condition until the operators take appropriate action to reactivate or secure the system.				
	NFPA-59A 7.6.1	Electrical equipment and wiring shall be of the type specified by and shall be installed in accordance with NFPA 70, National Electrical Code®.				

EVALUATION REPORT FOR LNG FACILITY CONSTRUCTION

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		NFPA-59A SUBPARTS (con't)	S	U	N/A	N/C
.2173	NFPA-59A 7.6.2	Fixed electrical equipment and wiring installed within the classified areas specified in Table 7.6.2 shall comply with Table 7.6.2 and Figures 7.6.2(a) through 7.6.2(d) and shall be installed in accordance with NFPA 70.				
	NFPA-59A 7.6.3	Each interface between a flammable fluid system and an electrical conduit or wiring system, including process instrumentation connections, integral valve operators, foundation heating coils, canned pumps, and blowers, shall be sealed or isolated to prevent the passage of flammable fluids to another portion of the electrical installation.				
	NFPA-59A 7.6.4	Where primary seals are installed, drains, vents, or other devices shall be provided for monitoring purposes to detect flammable fluids and leakage.				
	NFPA-59A 7.6.5	The venting of a conduit system shall be done in a manner that minimizes the possibility of damage to personnel and equipment, considering the properties of the liquid or gas and the potential for ignition.				
	NFPA-59A 7.7.1	General. Electrical grounding and bonding shall be provided.				
	NFPA-59A 7.7.3	If stray currents or impressed current can be present or is used on loading and unloading systems (such as for cathodic protection), protective measures to prevent ignition shall be taken.				
	NFPA-59A 7.7.4	Lightning Protection. Lightning protection shall not be required on LNG storage containers. *Exception: Lighting protection ground rods shall be provided for tanks supported on nonconductive foundations for personnel and foundation protection.*				
Comments: *(If any of the above is marked U, N/A, or N/C, please indicate why, either in this box or in a referenced note):*						

EVALUATION REPORT FOR LNG FACILITY CONSTRUCTION

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		NFPA-59A Chapter 10: USING ASME WITH MAXIMUM CAPACITY 100,000 gals/tank & 280,00 gals. AGGREGATE	S	U	N/A	N/C
.2173	NFPA-59A 10.2.1	Site preparation shall include provisions for retention of spilled LNG, within the limits of plant property, and for surface water drainage.				
	NFPA-59A 10.2.2	All-weather accessibility to the site for emergency services equipment shall be provided.				
	NFPA-59A 10.2.7	The maximum allowable working pressure shall be specified for all pressure-containing components.				
	NFPA-59A 10.3.1	All piping that is a part of an LNG container, including piping between the inner and outer containers, shall be IAW applicable standards.				
	NFPA-59A 10.3.2	Internal piping between the inner and outer tanks and within the insulation space shall be designed for the maximum allowable working pressure of the inner tank. Bellows shall not be permitted within the insulation space.				
	NFPA-59A 10.3.3	Containers shall be double-walled, with the inner tank holding LNG surrounded by insulation contained within the outer tank.				
	NFPA-59A 10.3.4	The inner tank shall be of welded construction in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, and shall be ASME-stamped and registered with the National Board of Boiler and Pressure Vessel Inspectors or other agency that registers pressure vessels.				
	NFPA-59A 10.3.5	The inner tank supports shall be designed for shipping, seismic, and operating loads.				
	NFPA-59A 10.3.6	The outer tank shall be of welded construction: (a) Appropriate carbon steel, IAW applicable stated standards, (b) If vacuum insulation is used, IAW applicable stated standards, (c) Maximum allowable working pressures shall be specified for all components, and (d) Thermal barriers shall be provided.				
	NFPA-59A 10.3.7.1	Shop-built containers designed and constructed IAW with ASME Boiler and Pressure Vessel Code, and their support systems, shall be designed for the dynamic forces associated with horizontal and vertical accelerations.				
	NFPA-59A 10.3.8	Each container shall be identified by the attachment of a nameplate(s) in an accessible location marked with the information required by the ASME Boiler and Pressure Vessel Code and the following: (1) Builder's name and date built (2) Nominal liquid capacity (3) Design pressure at the top of the container (4) Maximum permitted liquid density (5) Maximum filling level (6) Minimum design temperature				
	NFPA-59A 10.3.9	All penetrations on storage containers shall be identified. Markings shall be legible under all conditions.				

EVALUATION REPORT FOR LNG FACILITY CONSTRUCTION

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		NFPA-59A Chapter 10: USING ASME WITH MAXIMUM CAPACITY 100,000 gals/tank & 280,00 gals. AGGREGATE (con't)	S	U	N/A	N/C
	NFPA-59A 10.4	Containers designed to operate at a pressure > 15 psi shall be equipped with a device(s) that prevents the container from becoming liquid full or from covering the inlet of the relief device(s) with liquid when the container pressure reaches the set pressure of the relieving device(s) under all conditions.				
	NFPA-59A 10.5.1	(1) LNG container foundations, including saddles and legs, shall be designed and constructed in accordance with recognized structural and geotechnical engineering practices, including provisions for seismic loading as specified in 10.3.7, including those for shipping loads, erection loads, wind loads, and thermal loads. (2) Foundations and supports shall be protected to have a fire resistance rating of not less than 2 hours. (3) If insulation is used to achieve this requirement, it shall be resistant to dislodgement by fire hose streams.				
	NFPA-59A 10.5.2	LNG storage containers installed in areas subject to flooding, shall be secured in a manner that prevents the release of LNG or container flotation in the event of a flood.				
	NFPA-59A 10.6.1	LNG containers of 1000 gal and smaller shall be located: (1) 125 gal or less, 0 ft from buildings and the line of adjoining property (2) 1000 gal or less, 10 ft from buildings and the line of adjoining property				
	NFPA-59A 10.6.2	The minimum distance from edge of impoundment or container drainage system to buildings and property lines and between containers shall be in accordance with Table 10.6.2 for aboveground and mounded tanks larger than 1000 gal (3.8 m3).				
.2173	NFPA-59A 10.6.3	Underground LNG tanks shall be installed in accordance with Table 10.6.3.				
	NFPA-59A 10.6.4	Buried and underground containers shall be provided with means to prevent the 32°F isotherm from penetrating the soil. Where heating systems are used, they shall be installed such that any heating element or temperature sensor used for control can be replaced.				
	NFPA-59A 10.6.5	All buried or mounded components in contact with the soil shall be constructed from corrosion-resistant material or protected from corrosion deterioration.				
	NFPA-59A 10.6.6	A clear space of at least 3 ft shall be provided for access to all isolation valves serving multiple containers.				
	NFPA-59A 10.6.7	LNG containers > 125-gal capacity shall not be located in buildings.				
	NFPA-59A 10.6.9	LNG tanks and their associated equipment shall not be located where exposed to failure of overhead electric power lines operating at over 600 volts.				
	NFPA-59A 10.8.1	Provide with impoundment (dikes), topography, or other methods to direct LNG spills to a safe location and to prevent LNG spills from entering water drains, sewers, waterways, or any closed-top channel.				
	NFPA-59A 10.8.2	Flammable liquid storage tanks shall not be located within an LNG container impoundment area.				
	NFPA-59A 10.8.3	Impounding areas serving aboveground and mounded LNG containers shall have a minimum volumetric holding capacity, including any useful holding capacity of the drainage area and with allowance made for the displacement of snow accumulation, other containers, and equipment.				
	NFPA-59A 10.11.1	All piping that is part of an LNG container and the associated facility for handling cryogenic liquid or flammable fluid shall be IAW with ASME B 31.3.				

EVALUATION REPORT FOR LNG FACILITY CONSTRUCTION

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		NFPA-59A Chapter 10: USING ASME WITH MAXIMUM CAPACITY 100,000 gals/tank & 280,00 gals. AGGREGATE (con't)	S	U	N/A	N/C
.2173	NFPA-59A 10.11.2	The following requirements shall apply. (a) **NO** type F piping, spiral welded piping, and furnace buttwelded steel products. (b) Welding or brazing performed persons qualified under ASME Boiler and Pressure Vessel Code, Section IX. (c) **NO** Oxygen-fuel gas welding is permitted. (d) Brazing filler metal shall have a melting point exceeding 1000°F. (e) Austenitic stainless steel pipe and tubing for all services < −20°F. (f) Piping and piping components a minimum melting point of 1500°F. Exception No. 1: Gaskets, seats, and packing. Exception No. 2: Aluminum permitted for use downstream of a product retention valve in vaporizer service. (g) **NO** Compression-type couplings used where subjected to temperatures < −20°F unless they meet the requirements of ASME B 31.3., Section 315. (h) **NO** stab-in branch connections are permitted. (i) Extended bonnet valves shall be used for all cryogenic liquid service-bonnet angle is ≤ 45 degrees from the upright vertical position. (j) The level of inspection of piping shall be specified.				
	NFPA-59A 10.12.1	Instrumentation for LNG facilities shall be designed if power or instrument air fails, the system will go into a failsafe condition that can be maintained until the operators can take action to reactivate or secure the system.				
	NFPA-59A 10.12.2	LNG containers shall be equipped with two independent liquid level devices. One shall provide a continuous level indication ranging from full to empty and shall be maintainable or replaceable without taking the container out of service.				
	NFPA-59A 10.12.3.1	Each container shall be equipped with a pressure gauge, that has a permanent mark indicating the maximum allowable working pressure (MAWP) of the container and is connected to the container above the maximum liquid level.				
	NFPA-59A 10.12.3.2	Vacuum-jacketed equipment shall be equipped with instruments or connections for checking the pressure in the annular space.				
	NFPA-59A 10.12.4.1	(a) Safety relief valves are required on containers designed > 15 psi maintain LNG pressure IAWASME Boiler and Pressure Vessel Code. (b) The valve will be sized IAW NFPA-59A, Sect. 4.7.3 or CGA S-1.3. (c) The valves shall will communicate directly with the atmosphere.				
	NFPA-59A 10.12.4.2	(a) Each pressure relief valve for inner LNG containers shall be able to be isolated from the container for maintenance by means of a manual full-opening stop valve that is lockable or sealable in the fully open position. (b) Pressure relief valves shall be installed to allow each relief valve to be isolated individually for testing or maintenance while maintaining the full relieving capacities. (c) Where only one pressure relief valve is required, a full-port opening three-way valve under the pressure relief valve and its required spare is permitted in lieu of individual valves beneath each pressure relief valve.				
	NFPA-59A 10.12.4.4	Safety relief valve discharge stacks or vents are designed and installed to prevent accumulation of water, ice, snow, or other foreign matter. If arranged to discharge directly into the atmosphere, shall discharge vertically upward.				

Comments: *(If any of the above is marked U, N/A, or N/C, please indicate why, either in this box or in a referenced note):*

EVALUATION REPORT FOR LNG FACILITY CONSTRUCTION

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		§193.2181 IMPOUNDMENT CAPACITY: LNG STORAGE TANKS	S	U	N/A	N/C
.2181	.2181(a)	Each impounding system serving an LNG storage tank must have a minimum volumetric liquid impoundment capacity of: (a) 110 percent of the LNG tank's maximum liquid capacity for an impoundment serving a single tank; (b) 100 percent of all tanks or 110 percent of the largest tank's maximum liquid capacity, whichever is greater, for the impoundment serving more than one tank; or (c) If the dike is designed to account for a surge in the event of catastrophic failure, then the impoundment capacity may be reduced to 100 percent in lieu of 110 percent.				
Comments: *(If any of the above is marked U, N/A, or N/C, please indicate why, either in this box or in a referenced note):*						

	§193.2187 NONMETALLIC MEMBRANE LINER	S	U	N/A	N/C
.2187	A flammable nonmetallic membrane liner may not be used as an inner container in a storage tank.				
Comments: *(If any of the above is marked U, N/A, or N/C, please indicate why, either in this box or in a referenced note):*					

CONSTRUCTION					
	§193.2303 CONSTRUCTION ACCEPTANCE	S	U	N/A	N/C
.2303	No component may be placed in service until it passes all applicable inspections and tests prescribed by this subpart (D) and NFPA 59A.				
Comments: *(If any of the above is marked U, N/A, or N/C, please indicate why, either in this box or in a referenced note):*					

EVALUATION REPORT FOR LNG FACILITY CONSTRUCTION

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		§193.2304 CORROSION CONTROL	S	U	N/A	N/C
.2304	.2304(a)	(a) No components may be constructed, repaired, replaced, or significantly altered until a person qualified under §193.2707(c) reviews the applicable design drawings and materials specifications from a corrosion control viewpoint and determines that the materials involved will not impair the safety or reliability of the component or any associated components. Except:				
.2304	.2304(b)	(b) The repair, replacement, or significant alteration of components must be reviewed only if the action to be taken— (1) Does not involves a change in the original materials specified; (2) Is not due to a failure caused by corrosion; or (3) Inspections do not reveal a significant deterioration of the component due to corrosion.				
Comments: *(If any of the above is marked U, N/A, or N/C, please indicate why, either in this box or in a referenced note):*						

	§193.2321 NONDESTRUCTIVE TESTS	S	U	N/A	N/C
.2321	The butt welds in metal shells of storage tanks with internal design pressure above 15 psig must be radiographically tested in accordance with ASME Boiler and Pressure Vessel Code (Section VII Division 1),				
	Hydraulic load bearing shells with curved surfaces that are subject to cryogenic temperatures, 100 percent of both longitudinal (or meridional) and circumferential (or latitudinal) welds must be radiographically tested.				
Comments: *(If any of the above is marked U, N/A, or N/C, please indicate why, either in this box or in a referenced note):*					

		NFPA-59A SUBPARTS	S	U	N/A	N/C
§193.2301		Each LNG facility constructed after March 31, 2000 must comply with requirements of this part and of NFPA 59A.				
.2301	NFPA-59A 3.3	Installation of storage tanks for flammable refrigerants and liquids shall comply with NFPA 30, Flammable and Combustible Liquids Code; NFPA 58, Liquefied Petroleum Gas Code; NFPA 59, Utility LP Gas Plant Code; API 2510, Design and Construction of Liquefied Petroleum Gas (LPG) Installations; or Section 2.2 of this standard.				
	NFPA-59A 4.1.1	Prior to initial operation, containers shall be inspected to ensure compliance with the engineering design and material, fabrication, assembly, and test provisions of this standard. Exception: ASME containers.				
	NFPA-59A 4.3.4.1	Concrete LNG containers shall be built in accordance with ACI 318R, Building Code Requirements for Structural Concrete; Section 9 of ACI 301, Specifications for Structural Concrete; ACI 372R, Design and Construction of Circular Wireand Strand Wrapped Prestressed Concrete Structures; and ACI 373R, Design and Construction of Circular Prestressed Concrete Structures with Circumferential Tendons.				
	NFPA-59A 4.3.4.2	Concrete LNG containers shall be inspected in accordance with ACI Standard 311.4R, Guide for Concrete Inspection, and Section 6.5 of this standard.				

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		NFPA-59A SUBPARTS (con't)	S	U	N/A	N/C
.2301	NFPA-59A 4.3.4.1	Metal components shall be constructed and tested in accordance with the applicable provisions in Appendix Q of API Standard 620, Design and Construction of Large, Welded, Low- Pressure Storage Tanks.				
	NFPA-59A 10.2.3	Storage and transfer equipment at unattended facilities shall be secured to prevent tampering.				
Comments: *(If any of the above is marked U, N/A, or N/C, please indicate why, either in this box or in a referenced note):*						

PIM Entry Examples

(**reference http://www.gpoaccess.gov/fr/advanced.html ; fr12no03N Pipeline Safety: Corrosion Threat to Newly Constructed Gas and Hazardous Liquid Pipelines**).**POST INSPECTION MEMORANDUM (PIM)**			
POST INSPECTION MEMORANDUM (PIM)			
Name of Operator:	NoFail Pipeline Company	**OPID #:**	2314
Name of Unit(s):	Boardwalk and Parkplace	**Unit # (s):**	234, 278
Records Location:	Pipelineville, NC		
Unit Type & Commodity:	Interstate Natural Gas (A3) – Natural Gas		
Inspection Type:	Standard	**Inspection Date(s):**	12/24-27/03
OPS Representative(s):	John Brown	**AFO Days:**	4

Summary:

On December 24-27, I performed a standard inspection of the NoFail pipeline facilities contained in units 234 and 278. The evaluation report contains a component description of the two units. The inspection included a records and facilities review. A Joint O&M inspection was conducted in 2003 and no procedures were evaluated during this inspection. Pre-inspection preparation identified previous valve inspection violations: I reviewed all of the company's valve inspection records and five aboveground valve settings and did not identify any potential non-compliances. Right-of-way inspection and periodic cathodic protection checks were conducted between Chance, NC to Community Chest, NC and from Reading, SC to Ventnor, SC. The Mighty Big'nWet River crossing was evaluated for atmospheric corrosion.

Findings:

The pipeline facilities appeared to be well maintained and serious concerns were noted: surface rusting was observed at the Pipelineville compressor station. No pitting was observed. NoFail is in the process of repainting all of the aboveground piping at this facility.

The following concerns were noted from the records review:

1. The rectifiers in Unit 234 were inspected on 3 times in 2001, twice in 2002, and five times in 2003. Copies of the subject records were obtained.
2. The right-of-way in Unit 234 was densely overgrown such that aerial patrols would be ineffective. Pictures were taken of representative areas.